

**2nd reply to editor comments for
"The AutoICE Challenge"
[EGUSPHERE-2023-2648]**

Dear Editor Juha Karvonen,

On behalf of my co-author and myself, I would like to thank you again for considering our manuscript for publication in The Cryosphere. We have addressed your raised points to the best of our abilities. In the following, we provide a point-by-point answer to all the points raised. We have tried to gather all editor points in black. Our answers are highlighted in blue, the previous text in red, and our modifications in green. We have updated the *track changes* document to reflect the new changes based on our response to your comments.

Best regards on behalf of the authors,
Andreas Stokholm

Editor comments:

Dear authors of the manuscript egusphere-2023-2648,

The manuscript has improved from the previous version and many of the reviewer comments and my comments have been taken into account.

We are pleased that you found the revised manuscript improved.

The important value of the article is that a good reference data set has been created and the challenge participants have provided a good reference performance measures that can be used testing new (continuously developing) machine learning methods for sea ice parameter estimation.

This could be emphasized even more in the introduction and/or discussion/conclusion sections. For future developments it is very useful to have a reference data set and also some reference estimation results. The provided data set and the challenge have provided these.

We agree that the reference dataset is a valuable contribution to the automatic sea ice mapping community. We suggest adding the following modifications to the manuscript at L87:

Furthermore, the challenge has provided a common reference dataset that can be used as a benchmark for comparisons of future model developments.

and L95:

In addition, the challenge provides a common reference benchmark to support further comparisons in future model developments within the community.

In the discussion at L547:

In the challenge, 20 scenes were selected for testing the models. Naturally, evaluating the

models more thoroughly with many more ice conditions, years, and geographical areas than in the test set is necessary. To perform comparative studies of different SAR-based sea ice retrievals of SIC, SOD and FLOE to establish the state-of-the-art, there is a need for a standardized benchmarking dataset.

To perform comparative studies of different SAR-based sea ice retrievals of SIC, SOD and FLOE to establish the state-of-the-art, there is a need for a standardised benchmarking dataset. Here, the challenge has provided an initial version of such a reference dataset with 20 scenes selected for testing the models. Naturally, evaluating the models more thoroughly with many more ice conditions, years, and geographical areas is desired and presents a key opportunity to further contribute to the automatic sea ice mapping community. Creating an online dashboard [ImageNet 2024] with sea ice retrieval test results akin to *ImageNet* [Deng 2009] could drive further competition and innovation in this space.

I noticed that at least the following reference is missing in the reference list:

X. Chen, M. Patel, L. Xu, Y. Chen, K. A. Scott and D. A. Clausi,
Weakly Supervised Learning for Pixel-Level Sea Ice Concentration Extraction Using AI4Arctic Sea Ice Challenge Dataset, in IEEE Geoscience and Remote Sensing Letters, vol. 21, pp. 1-5, 2024, Art no. 1500205, doi: 10.1109/LGRS.2023.3338061.

This reference can be used to justify the use of ice charts as training data for higher-resolution estimation. There are also other possibilities, e.g. automatically manipulating the ice chart training data within the ice chart segments based on SAR data and the segment-wise information and to create a high-resolution target classification this way before applying the actual machine learning algorithm. In any case, utilizing ice chart information in training to automatically provide higher-resolution estimates is an important future research topic.

We agree that this article is worth mentioning in the related works section at L82:

Furthermore, the authors in [Chen 2024] have shown that detailed SIC maps can be obtained by training models with sea ice charts.

The aspect of future work has been highlighted in future works at L610

Furthermore, developing models capable of producing higher-resolution sea ice maps compared to the manually derived sea ice charts could yield further advantages of utilising an automatic approach.

It is unpleasant that not much information on some of the challenge participants could not be included in the manuscript. I hope for the possible future challenges related to this valuable data set the participants will at least be required to provide a thorough description of the algorithm and results in a form of a document. Additionally, source code would of course be preferable. Without a proper documentation the methods and the results can not be properly evaluated.

We agree that it would have been preferable to include information on the remaining two top-5 teams. Ultimately, this needs to be considered in the design phase of new challenges. Perhaps inspiration for accomplishing this can be gained from *ImageNet*.

After these minor revisions, I think the manuscript can be published as the overview article of the AutoIce challenge TC special issue.

We are pleased with your assessment and hope the modifications presented here are satisfactory.